CHALLENGES TO THE WATERFOWL RESOURCES OF THE SAN FRANCISCO BAY

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HISTORICAL AND MODIFIED HABITAT

Fluctuating sea levels resulted in the creation of an extensive marsh and mudflat complex within the San Francisco Bay. The entire Estuary complex was historically the largest contiguous tidal marsh system on the Pacific Coast of North America, and remains the largest estuary on the conterminous United States. Historically the Estuary supported over 220,000 ha of tidal wetlands (SFEP 1991). The hydraulic mining in the Sierra-Nevada foothills, conversion of tidelands to agriculture in the late 1800s and early 1900s, and urban and industrial expansion have greatly reduced the quality of this system (Nichols et al. 1986).

Initially the most extensive use of Bay tidal wetlands by early settlers was for agriculture. Diking of tidal lands, principally for grazing and cereal grains, occurred between 1860 and 1910. The tidal wetlands of the South Bay had extremely saline soils, lacked readily available irrigation water, and had high evaporation rates in summer (Josselyn 1983). These conditions made it highly favorable for solar crystallizing salt production. Beginning in 1856, salt was produced from evaporation ponds. By the 1930s, over 160 km^2 had been diked in the South Bay for salt production (Josselyn 1983). Through mergers and acquisitions, the Leslie (later Cargill) Salt Company gained control of all salt operations. The company expanded operations to the San Pablo Bay in 1952 when it purchased 45 km^2 of diked agricultural land and converted it to salt evaporation ponds (Josselyn 1983). Salt produced in San Francisco Bay totals approximately two million tons annually. In the early 1980s the U.S. Fish and Wildlife Service purchased 62 km^2 of salt ponds from Leslie Salt, primarily in the South Bay (Josselyn 1983). The terms of the sale allow Cargill to produce salt there until the company no longer considers it feasible. In 1993, Cargill placed all of its properties in San Pablo Bay up for sale.

Urban expansion occurred during three main periods, shortly after the Gold Rush in the mid-1800s, post World War II, and after the mid-1960s. This growth greatly reduced the quantity and quality of estuary wetlands. Such human population increases resulted in large residential developments within and adjacent to wetland areas; industrial, military and commercial developments; over 320 marinas; solid waste landfills; and substantial disturbance of wildlife.

According to the National Wetland Inventory, the current composition of estuary wetlands in the San Pablo Bay and Central and South Bays of San Francisco Bay is 23,380 ha mudflats, 11,060 ha farmed wetlands, 10,300 ha emergent marshes, 8,560 ha seasonal

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wetlands, 940 ha riparian forest, and 14,810 ha salt ponds (SFEP 1991). The composition of deepwater and wetland types has also been identified by location in North or South Bay (Houghten et al. 1989). These data include for the North Bay, 41,270 ha of open water, 960 ha of lakes, reservoirs and ponds, 11,330 ha of intertidal mudflats, 6,610 ha of tidal salt marsh, 3,890 ha seasonal wetlands, 10,450 ha of farmed wetlands, 40 ha of riparian wetlands, and 3,650 ha of salt ponds; and for the South Bay, 37,720 ha of open water, 915 ha of lakes, reservoirs and ponds, 12,300 ha of intertidal mudflats, 3,480 ha of tidal salt marsh, 3,600 ha of seasonal wetlands, 530 ha of farmed wetlands, 70 ha of riparian wetlands, and 11,130 ha of salt ponds (Houghten et al. 1989).

Salt marsh plants dominate the historical Bay landscape, and pacific cordgrass (Spartina foliosa) and perennial pickleweed (Salicornia virginica) are the principal species present. Cordgrass is usually found at lower intertidal elevations and pickleweed at higher elevations (Josselyn 1983). Both species are perennial and produce viable seeds, but both spread primarily by vegetative growth and rhizomes (Josselyn 1983).

HISTORICAL AND CURRENT WATERFOWL POPULATIONS

San Francisco Bay was one of the most important waterfowl areas in all of coastal North America. The magnitude of market hunting at the turn of the century attests to the great numbers of birds that must have been present. In 1900, the five game transfer companies were handling a minimum of 250,000 ducks per year in the San Francisco markets (SFEP 1992). Mallards, American wigeon, and green-winged teal accounted for more than 280,000 birds sold in San Francisco markets in the 1895-6 season (Grinnell et al. 1918).

Today the San Francisco Bay is still one of the most important staging and wintering areas for waterfowl populations, especially diving ducks, in the Pacific Flyway. More ducks winter in the Estuary than in the much larger Chesapeake Bay (SFEP 1992). San Francisco Bay has consistently wintered nearly one-half of the total birds found in the entire Estuary (including Suisun Marsh and the Delta). Midwinter surveys during 1981-90 indicated that an average of 193,000 waterfowl were present on the open water and salt ponds of San Francisco Bay. During that time, the relative composition of waterfowl species in the Bay was scaup species (35%), scoter species (14%), northern shoveler (12%), ruddy duck (11%), canvasback (8%), other dabbling ducks (10%), and other ducks (10%). The most abundant diving ducks over the past ten years have been scaup, surf scoter, ruddy duck, canvasback and bufflehead, in that order (SFEP 1992).

During the winters of 1987-90, most waterfowl were found in the North Bay (30%) or South Bay salt ponds (23%), as compared to the Central Bay (16%), South Bay (12%), North Bay salt ponds (12%), or Suisun Marsh (7%)(SFEP 1992). Scaup and scoter species

dominated open water Bay habitats, with 74% and 18% respectively in the North Bay, 66% and 30% in the South Bay and 39% and 57% in the Central Bay. Waterfowl of the South Bay salt ponds were dominated by northern shoveler (46%) and ruddy duck (20%), while salt ponds of San Pablo Bay were dominated by canvasback (22%), ruddy duck (20%), and scaup (19%)(SFEP 1992). Swan and goose populations are generally low in the Bay wetlands. During most years, about 25% of the canvasbacks found in North America during January are counted in the Pacific Flyway mid-winter surveys, with 81% of these in California (J. Bartonek, pers. comm.). Of the California wintering canvasback, approximately 65% were counted in the Estuary (SFEP 1992). Degradation of submergent plants and mollusc beds in the Bay has reduced the quality of habitat for diving ducks.

The Bay habitats are also the most important wetland complex for migrant shorebirds in the western continermous United States. At least 34 shorebird species, numbering over 1.1 million birds use the San Pablo and San Francisco Bay habitats (SFEP 1992). The tidal wetlands are also critical habitat for clapper and black rails. Both rallid species reflect alarming, recent declines in populations (Eddleman et al. 1988).

CONTINUED CHALLENGES AND OPPORTUNITIES

Human disturbance can result in flight or diving behavior by waterfowl to escape such activity. These behaviors are among the most energetically expensive, between 5-15 times basal metabolic rate, that birds can face. Expanding human populations in the Bay will only increase waterfowl and human interactions and disturbance. Human population levels in the San Francisco Bay area will soon reach over 7 million. Refuges which allow people to view waterfowl from a distance will become more important in the near future. Waterfowl hunting has long been a tradition in the Bay. Many local municipalities are now restricting hunting activities. Leased lands for duck clubs has been one means to restrict extensive disturbance of most birds and provide habitat for waterbirds without public ownership and maintenance expenses.

Federal acquisition of lands in the Bay include 154 km^2 for San Francisco Bay National Wildlife Refuge (NWR) and 47.3 km^2 for San Pablo NWR. San Francisco Bay NWR is the most visited refuge in the entire national system. Recently, an additional acquisition of the Cullinan Ranch was made in the North Bay, which will add 600 ha to protected status. Unfortunately, changing the owner on a land title does not always protect waterfowl habitat. Extensive restoration activities may be necessary in many diked tidal wetlands, whether in public or private ownership. Restoration and protection of tidal wetlands in San Pablo Bay will probably provide the greatest quality wetlands for waterfowl. Contaminants will continue to pose a risk for all waterbirds (Ohlendorf et al. 1986).

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